

ART: Surveying the Local Universe at 2–11 keV

NASA MSFC S.L. O'Dell, B.D. Ramsey, M.L. Adams,
R.F. Elsner, M.V. Gubarev, M.C. Weisskopf

MPE (Germany) G. Hasinger, N. Meidinger, P. Predehl

IKI (Russia) V. Areviev, M. Buntov, I. Lapshov,
M. Pavlinsky, M. Revnivitsev, S. Sazanov,
N. Semena, A. Tkachenko

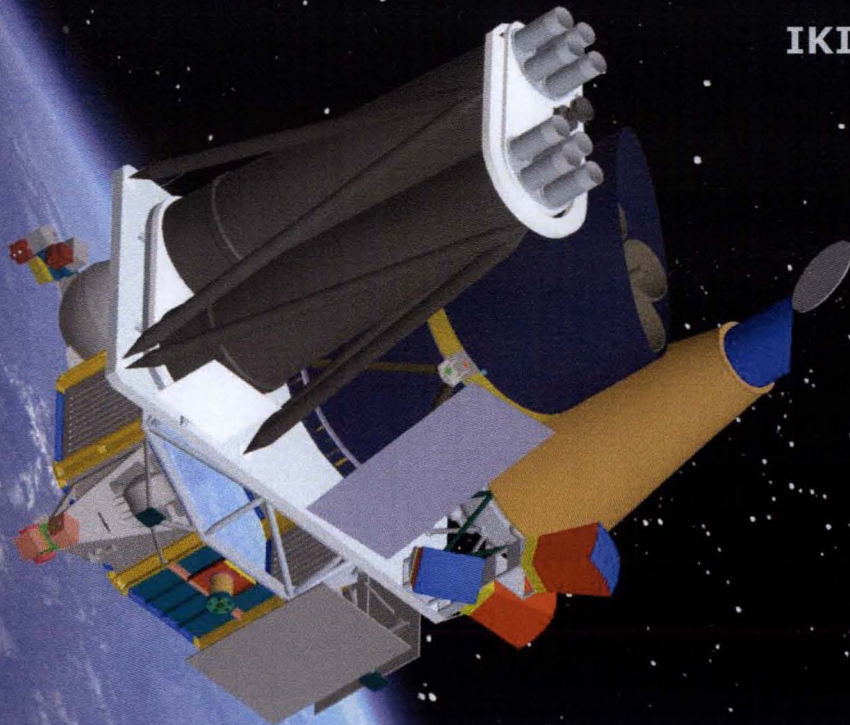
SAO S.E. Romaine, A. Viklinin

VNIIEF (Russia) S. Grigorovich, D. Litvin

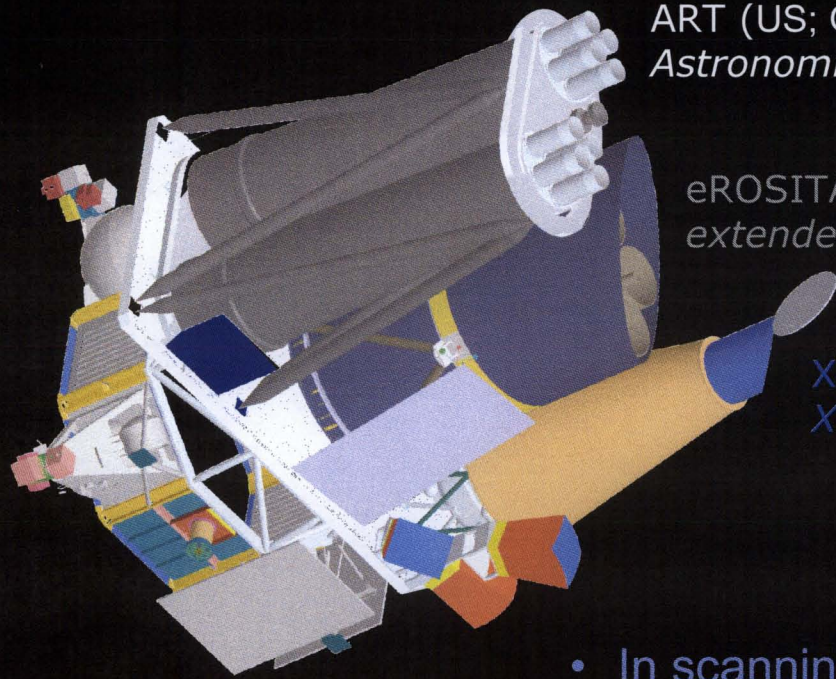
USRA D.A. Swartz

Penn State W.N. Brandt

Yale C.M. Urry



Spectrum Röntgen Gamma (SRG) is a new, Russian-led x-ray astronomy mission.



ART (US; Germany; Russia)
Astronomical Röntgen Telescope

eROSITA (Germany)
extended Röntgen Survey with an Imaging Telescope Array

XRS (Japan & US; Germany)
X-Ray Spectrometer

- In scanning mode, SRG will perform an all-sky survey of unprecedented sensitivity, with CCD energy resolution.
- In pointed mode, SRG will obtain long exposures, with microcalorimeter energy resolution.

ART is a medium-energy x-ray telescope system for SRG, proposed as a 3-nation collaboration.

Mirror assembly

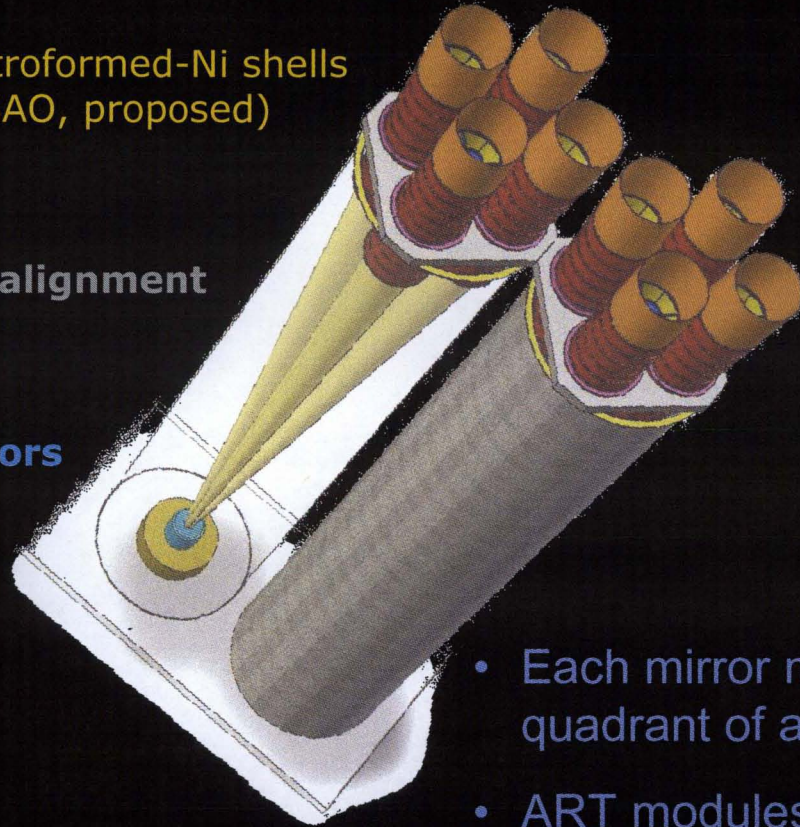
2×4 modules of electroformed-Ni shells
US (NASA/MSFC & SAO, proposed)
Russia (VNIIRF)

Optical bench and alignment

Russia (IKI)

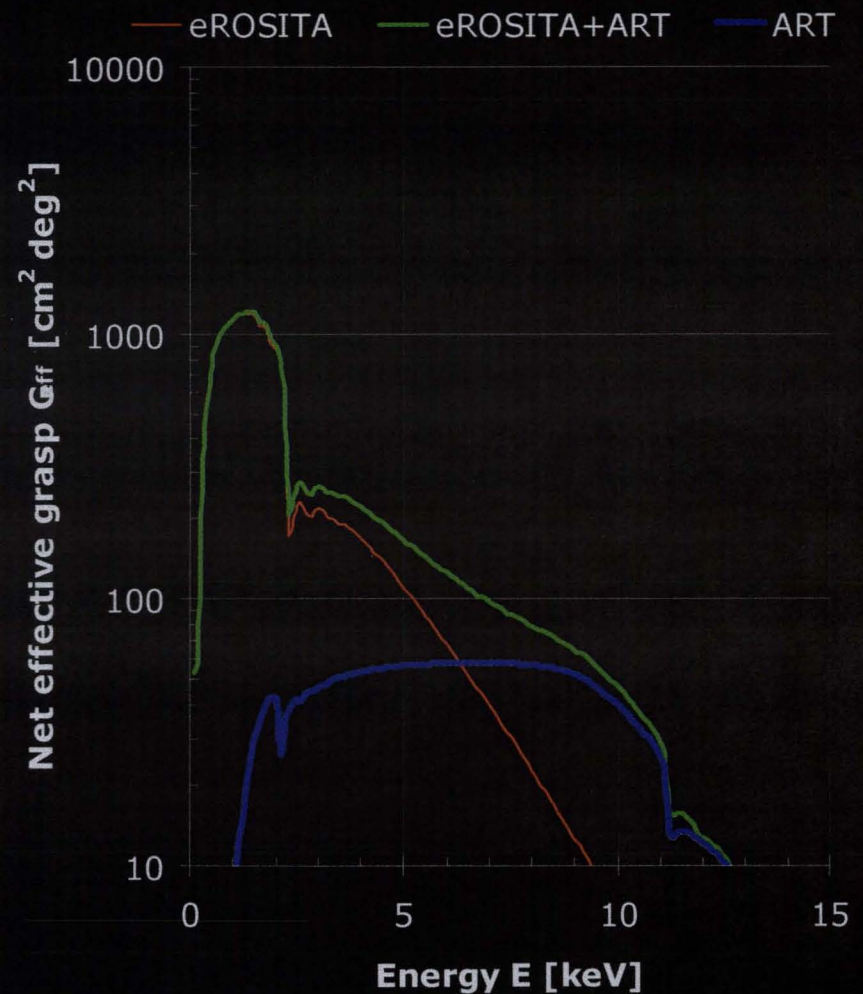
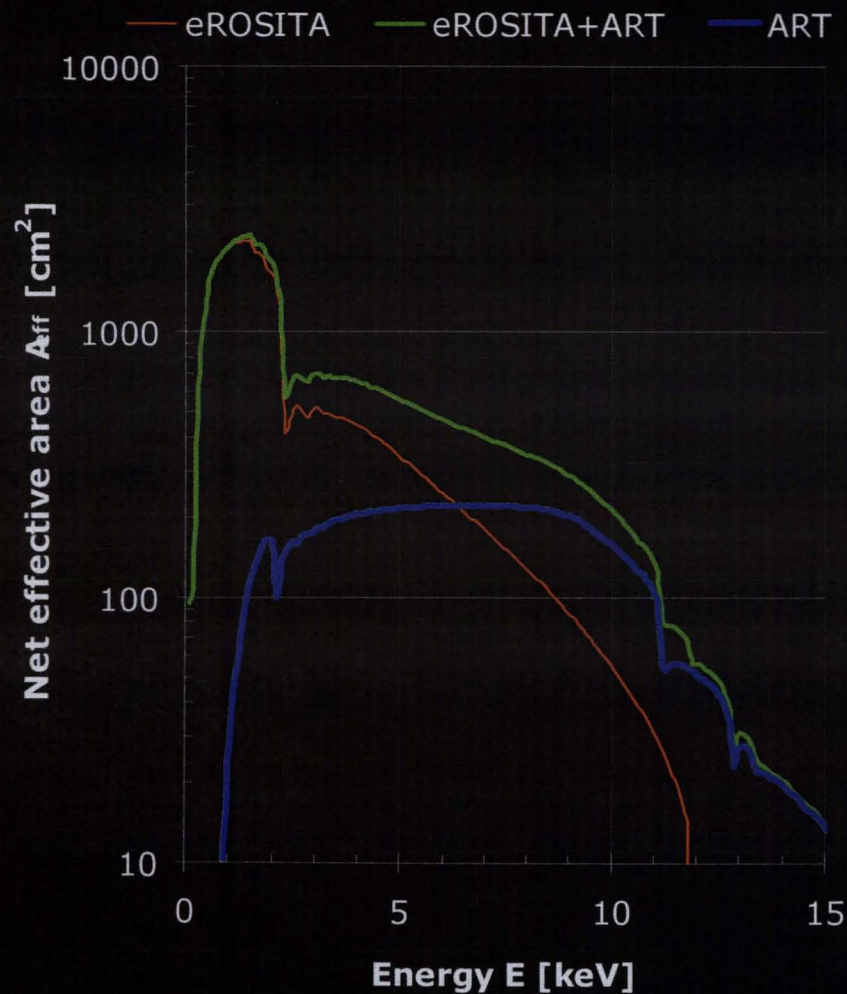
Focal-plane detectors

2 eROSITA CCDs
Back-illuminated pn
50-ms integration
450- μ m depletion
Germany (MPE)



- Each mirror module images onto a distinct quadrant of a CCD.
- ART modules point 3° from mean direction.
- Align 1 pair of modules to eROSITA & SRG.

ART extends the spectral coverage of eROSITA to 11 keV (15 keV for pointed observations).



This extended coverage increases detections of Fe-K lines by 3, heavily obscured AGN by 3–5.

ART will detect nearly 100,000 AGN >2 keV.

SRG ART	All-sky	Polar	Point
Survey Ω [deg ²]	41,000	400	125
Sensitivity [erg cm ⁻² s ⁻¹]	3.1×10^{-13}	3.4×10^{-14}	8×10^{-15}
Detected #	52,000	14,000	31,000
# > 100 cts	1,000	310	3,100

eROSITA will detect many more soft sources.

Expected all-sky detections of obscured AGN

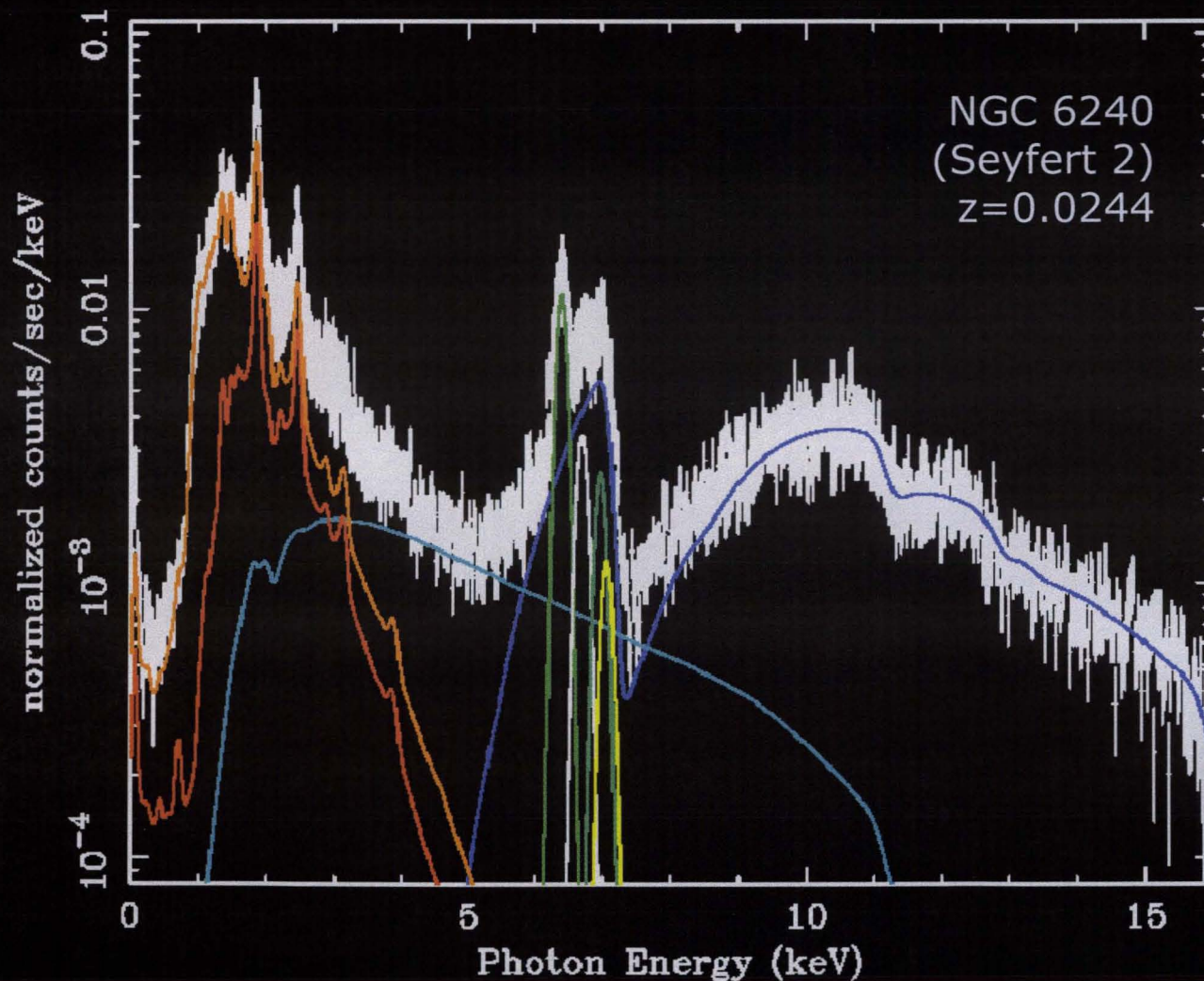
Column N_H [cm ⁻²]	eROSITA alone	ART alone	eROSITA +ART
$> 1 \times 10^{23}$	5000	3000	12,000
$> 3 \times 10^{23}$	600	700	1,800
$> 1 \times 10^{24}$	20	60	100

Estimates are based upon Treister & Urry 2005.



Urry & Padovanin 1995

ART bridges the soft- and hard-X-ray bands,
complementing other missions—e.g., NuSTAR.



ART response for
model spectrum
(Vignati et al. 1999)

Transparent thermal:

0.5 keV

0.7 keV

Fe-K lines:

neutral fluorescence

helium-like

hydrogen-like

Compton-reflected
power law

Heavily-absorbed
($N_H = 2 \times 10^{24} \text{ cm}^{-2}$)
power law ($\Gamma = 1.8$)